Fig. 1. Transmission Electron Microscope (TEM) study of potatoes resulting from addition of W and Pt to the superconductor $YBa_2Cu_3O_{7-\delta}$ (Y123). Dark, roughly circular objects are potatoes of $(W_{0.5\pm0.1}Pt_{0.5\mp0.1})YBa_2O_6$ of diameter circa 200-300 nanometers.

Fig. 2. TEM study of potatoes resulting from the addition of Mo and Pt to the superconductor $YBa_2Cu_3O_{7-\delta}$ (Y123). Dark, roughly circular objects are potatoes of $(Mo_{0.5\pm0.1}Pt_{0.5\mp0.1})YBa_2O_6$ of diameter circa 200 nanometers. One of the 2 particles in the lower left is Y_2BaCuO_5 (Y211), a non-superconducting phase of YBaCuO.

Fig. 3. TEM study of potatoes resulting from addition of U and Pt to the superconductor $SmBa_2Cu_3O_{7-\delta}$ (Sm123). Dark, roughly circular objects are potatoes of $(U_{0.6\pm0.1}Pt_{0.4\mp0.1})SmBa_2O_6$ of diameter circa 200-400 nanometers. This sample has been irradiated with thermal neutrons resulting in fission of some of the ^{235}U isotope. Fine lines in center of upper third of picture are damage lines created by fission fragments.

Fig. 4. Electron Microprobe study of potatoes resulting from the addition of U and Zr to the superconductor $NdBa_2Cu_3O_{7-\delta}$ (Nd123). Bright very small objects are potatoes of $(U_{0.5\pm0.1}Zr_{0.5\mp0.1})NdBa_2O_6$, of diameter circa 400 nanometers. Larger, light objects are $Nd_4Ba_2Cu_2O_{10}$, a non-superconducting phase of NdBaCuO.

Fig. 5. Electron Microprobe study of potatoes resulting from mixing the pre-reacted compound $(U_{0.6}Pt_{0.4})YBa_2O_6$ to powders of the superconductor Nd123, followed by texturing of the mixture. Small bright objects are deposits of the UPtYBaO compound.

percentage (by weight) of

Fig. 6. Critical current density, J_c, vs. % $UO_4 \bullet 2H_2O$ (weight) added to $YBa_2Cu_3O_{7-\delta}$ (Y123). J_c was calculated from maximum trapped magnetic field in single grains of Y123, 2 cm diam. x 0.8 cm long. Note that as more U is added, trapped field increases by 60%. If J_c were measured at constant field, as is usually done, the enhancement factor in this measurement would significantly exceed 2.0.

Fig. 7. Ratio of trapped field with X% WO_3 to trapped field with no WO_3. WO_3 is added to Y123 powders plus 1.25% Pt, before texturing.

Fig. 8. Schematic showing how potatoes are buried in and surrounded by oxide superconductor.

Fig. 9. Microprobe studies showing texturing effect of ZrO_2 addition to Nd123. Top left no ZrO_2; top right 0.04% (wt) ZrO_2; bottom left 0.1% (wt) ZrO_2; bottom right 0.2% (wt) ZrO_2.

<u>Fig. 10.</u> Schematic showing three classes of pinning centers. Top shows small # of large deposits of Y211. Second shows refinement of Y211, providing a first class of pinning centers, and small deposits containing foreign as well as native elements (e.g., A, B, RE, BaO), which provide a second class of pinning centers. Bottom shows lines of damage caused by fission fragments, which provide a third class of pinning centers.

100nm

TEM

Fig 1

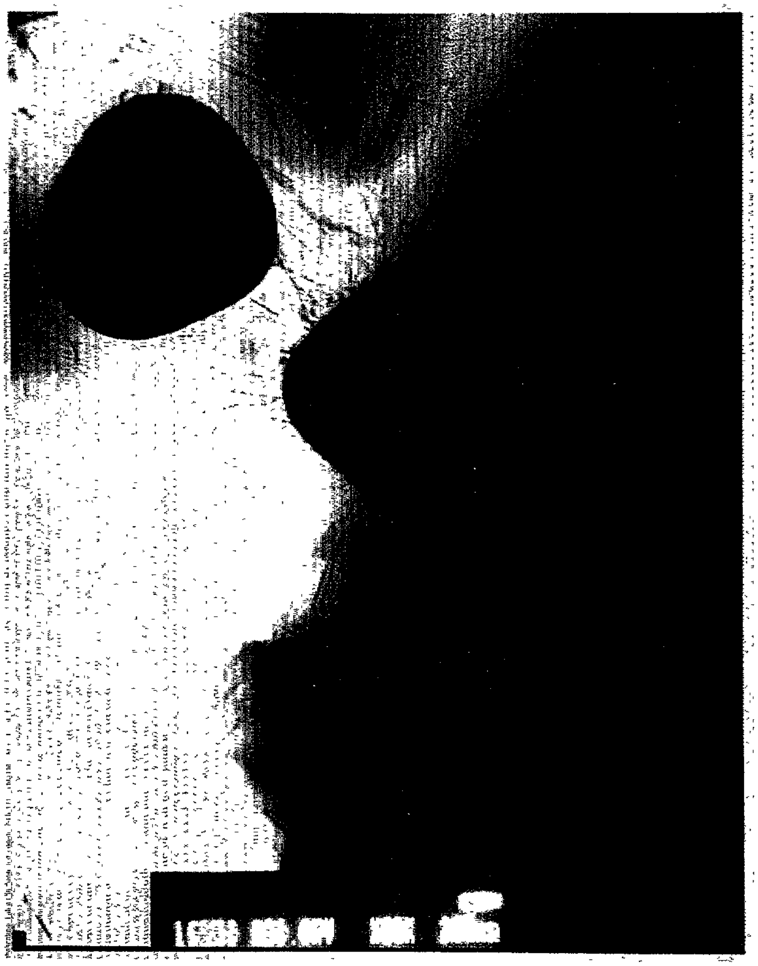
60% Y211 + Y123 + 1.0% Pt + 0.36% WO_3

60% Y211 + Y123 + 0.5% Pt + 0.3% MoO_3

Fig 2

TEM

On double sphere, left + low, one is Y211, other is MoPt-S



TEM After Irradiation Fig 3

20% Sm211 + Sm123 + 0.5% Pt + 0.15%/250 ppm $^{235/238}UO_4 \cdot 2H_2O^*$

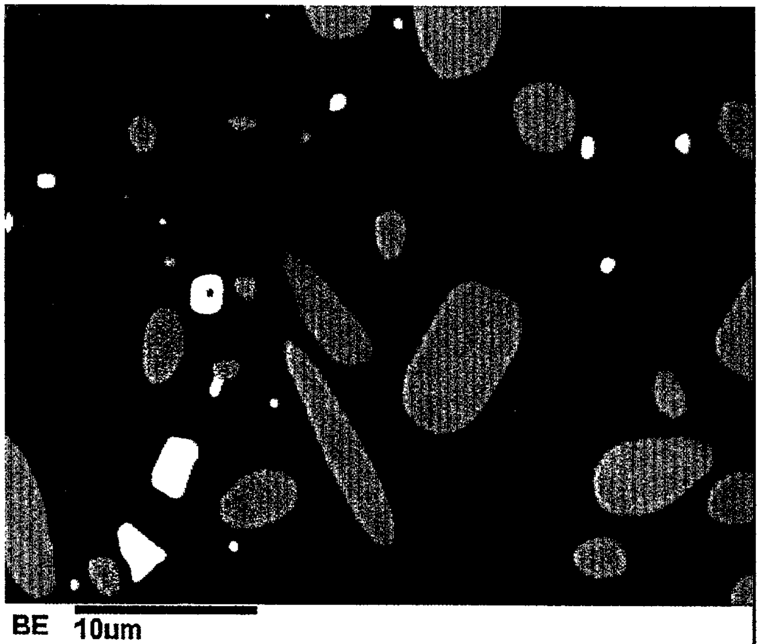
Very thin lines in center, upper third are damage tracks left by U fission

BE Nd1.8+0.15U+0.048Zr 10um

Micromobe

Fig 4

20% Nd422 + Nd123 + 0.15% $UO_4 \cdot 2H_2O$*
+ 0.048% ZrO_2



Microprobe Fig 5

$20\%\ Nd422 + Nd123 + 0.44\%\ {}^{238}(U_{0.6}Pt_{0.4})YBa_2O_6$

Y-5

Small bright area
Y-5
i.e., U containing deposits

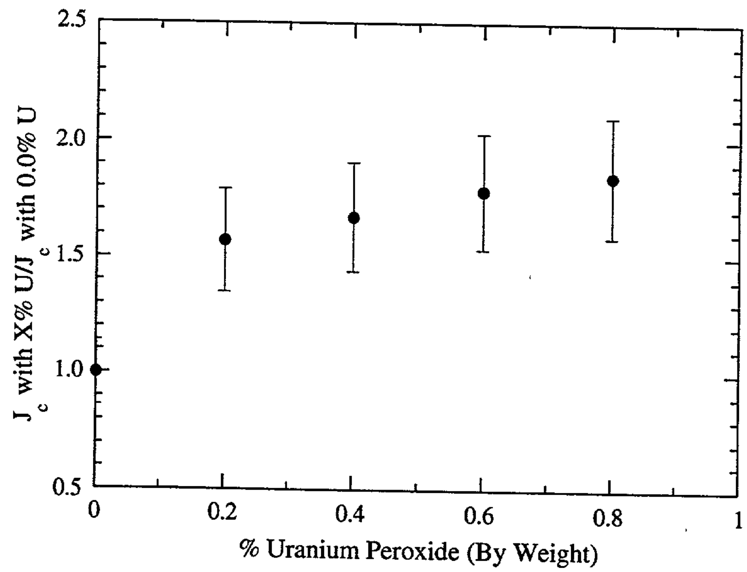


Fig 6

60% Y211 + Y123 + 0.5% Pt + Varying % $UO_4 \cdot 2H_2O$*

Jc calculated from field plots and J. Liu's Program

Field Cooled @ 2 Tesla

2 cm Samples

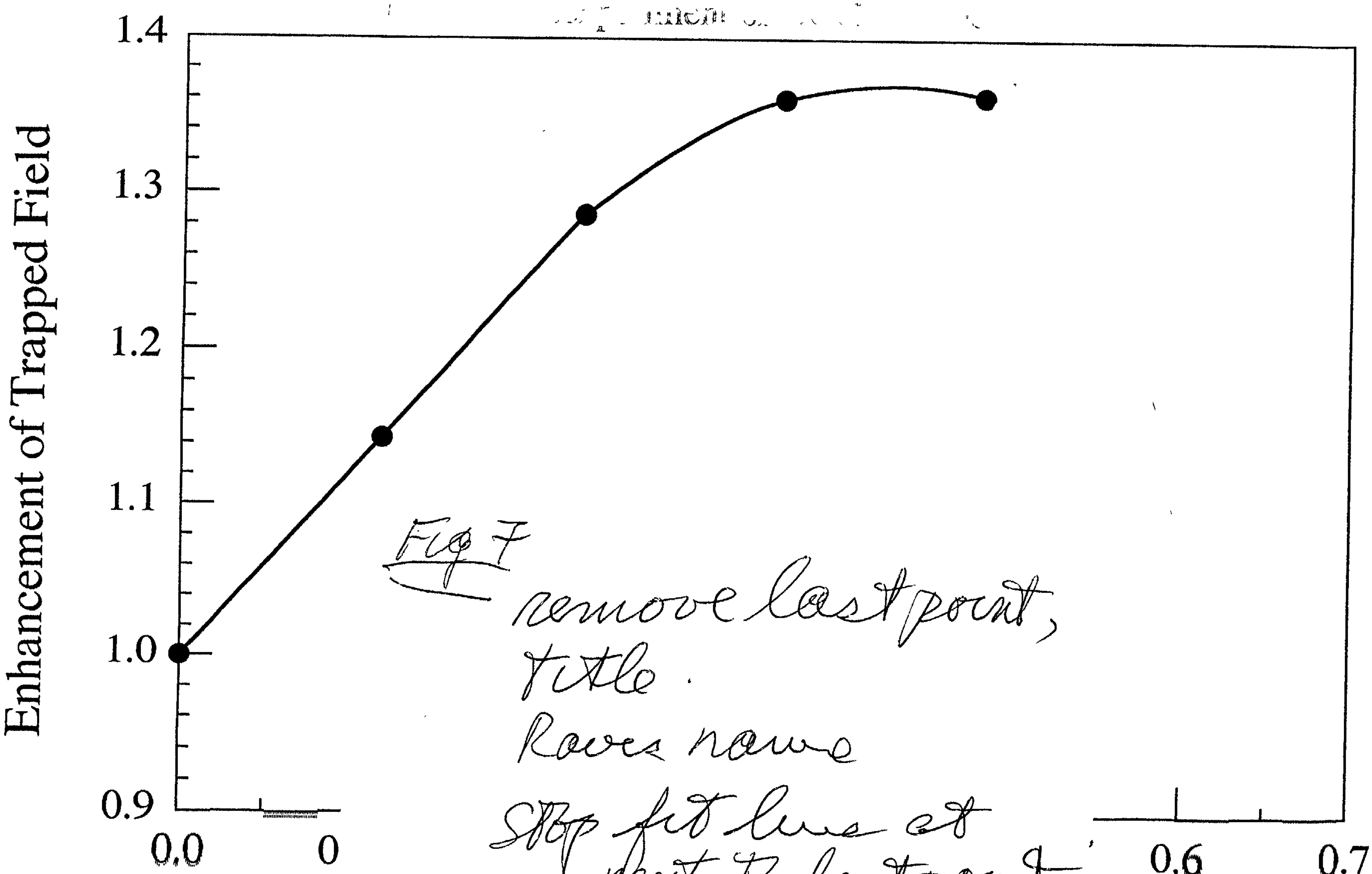


Fig 7

remove last point,
title.
Raves name
Stop fit line at
next to last point

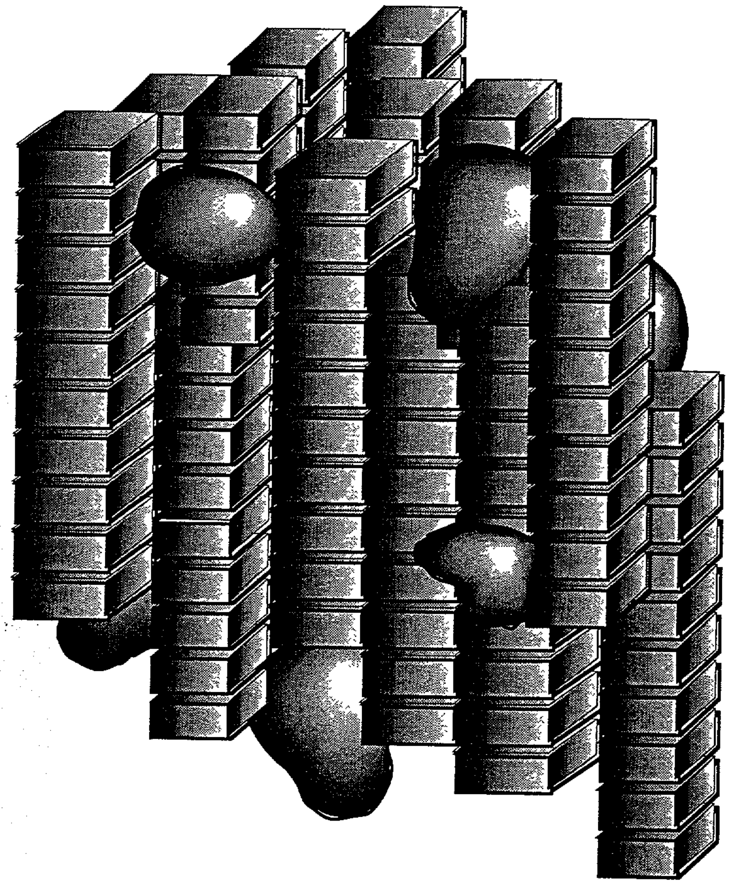
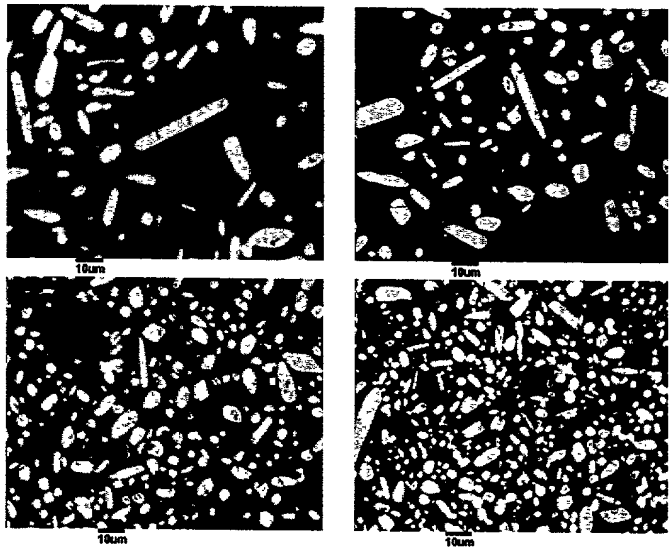


Fig 8



Microprobe

Fig 9a

Top Left: 20% Nd422 + Nd123

Top Right: 20% Nd422 + Nd123 + 0.04% ZrO_2

Bottom Left: 20% Nd422 + Nd123 + 0.1% ZrO_2

Bottom Right: 20% Nd422 + Nd123 + 0.2% ZrO_2

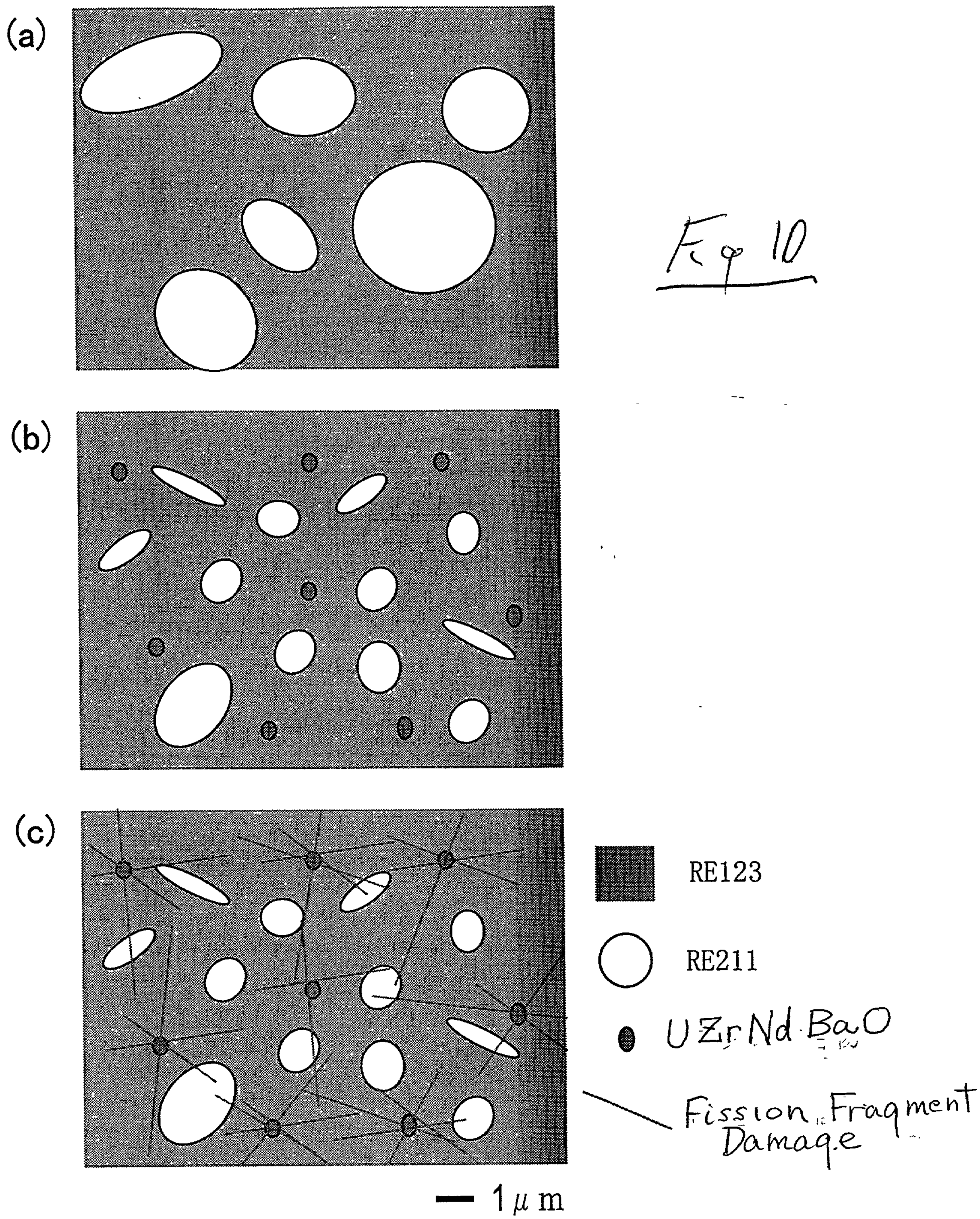


Fig 10